

Data Innovation Complementarity and Firm Growth

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Motivation

- There is a lot of heterogeneity across firms in how they adopt and benefit from AI and big data technologies
- Question: what makes a company successful in the data economy?
 - Firm size (e.g., Babina et al., 2024)
 - Labor composition (e.g., Eisfeldt et al., 2024)
 - This paper: **innovation complementarity**

This paper

- Different firms differ in the complementarity between data-security innovation and other innovation
- There is a positive shock to data-security innovation
 - Technological
 - Policy: Data Breach Notification (DBN) Laws
- Firms with high-complementarity benefit more from the shock in terms of overall innovation and profitability
- Analogy: research and teaching
 - High complementarity: Fintech elective
 - Low complementarity: Finance 101

Empirical measure

- Empirical challenge: measuring innovation complementarity is hard
- Approach: look at the share of data-security inventors in non-data-security patents
- It's an intuitive measure: inventors working in both data-security and non-data-security patents can bring knowledge flows across both domains

Comment 1: Sample

- Low complementarity firms are firms with a small share of data-security inventors in non-data-security patents
- Firms with zero data-security patents/inventors have share equal to zero by this definition. Are they in the low complementarity group?
- Ideally, you want to compare firms with similar data-security innovation but different complementarities
- Would be useful to clarify which and how many firms are in high and low complementarity groups

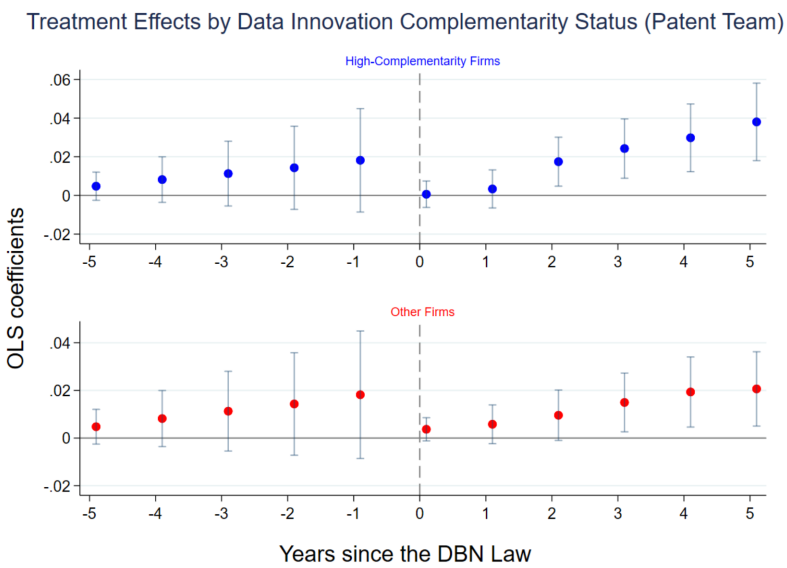
Comment 2: High vs low complementarity firms

- The main empirical analysis compares how high and low complementarity firms react differently to DBN Laws
- Are high and low complementarity firms different along other dimensions?
 - Are they in different industries?
 - Do they differ in firm size or inventor team size?
 - Do they innovate in different fields?
- High-complementarity firms may have more data or more innovation in big data and AI fields, which also benefit from DBN laws
 - Look at innovation in non-data-security but data-related fields

Comment 3: Missed opportunity?

- DBN laws push firms to invest more in data security and activate the positive data feedback loop (more innovation, higher growth and profits) for high complementarity firms
- But why don't high-complementarity firms invest more in data security in the first place? Organizational frictions?
- DBN laws increase the demand for data security innovation
 - In the model, high-complementarity firms sell their data-security innovation to low-complementarity firms. Do you see that in the data?
 - Look at the value of data-security patents using the KPSS measure

All firms increase their complementarity after the DBN laws



Comment 4: More details on the mechanisms

- Do firms hire more inventors or incentivize existing inventors to innovate more?
 - Is there a reallocation of inventors across high-complementarity and low-complementarity firms?
- Do low complementarity firms substitute non-data-security innovation for data-security innovation (by shifting the focus on hiring or efforts of existing inventors)?
 - This would be consistent with an increase in data-security patents but a decrease in non-data-security patents
- Is complementarity about people or organization?
 - Do you see the same pattern if measuring complementarity using citations?

Other comments

- ROA responds in year 0 and before the increase in patenting. There is likely something else driving the changes in ROA
- Market share goes in the same direction for high and low complementarity firms. Is there an excluded group?
- California is the first state to pass DBN laws. Do the results still hold if excluding California?
- Poisson models for patents
- Allow for heterogeneous pre-trends of high and low complementarity firms for all outcomes

Conclusion

- This paper highlights the importance of innovation complementarity in driving firm success in the data economy
- It uses data security as a laboratory, but it has broader implications